

Align food system to hydrological, energy realities

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As India aspires to sustain high economic growth while ensuring food security for 1.4 billion people, a silent crisis is unfolding beneath its fields and rivers. The World Bank's latest flagship report, "Nourish and Flourish: Water Solutions to Feed 10 Billion People on a Livable Planet," delivers a stark warning: the global food system is fundamentally misaligned with hydrological realities. For India, this is not a distant global concern—it is an immediate national challenge. What makes this moment more urgent is a parallel warning from the International Energy Agency (IEA), whose 2026 "Sheltering from Oil Shocks" plan highlights how energy disruptions can rapidly cascade into food and water crises.



The World Bank estimates that current the agricultural water systems can sustainably support food production for only about onethird of the projected global population by 2050 if inefficiencies persist. At the heart of this crisis lies not absolute scarcity, but mismanagement of water within food systems. India exemplifies this paradox. It is effectively a waterstressed food exporter, producing waterintensive crops such as rice and sugar in regions already experiencing groundwater depletion. In doing so, India exports vast volumes of "virtual water," deepening domestic stress.

Nowhere is this imbalance more evident than in Punjab and Haryana, where groundwater levels are declining at alarming rates—often exceeding one metre annually. The underlying driver is well known: free or highly subsidised electricity for irrigation pumps. When the marginal cost of energy approaches zero, groundwater extraction becomes effectively unbounded. This is a classic nexus failure — where energy policy distorts water use, and agricultural incentives reinforce unsustainable production. It is here that the IEA's recent framework offers a critical complementary insight. The "Sheltering from Oil Shocks" plan underscores that modern economies remain deeply vulnerable to energy disruptions, particularly in oilimporting countries like India, which imports nearly 85–90% of its crude oil. The IEA's proposed measures—ranging from promoting remote work and reducing nonessential travel to improving transport efficiency—are designed to rapidly curb oil demand during crises. While seemingly distant from agriculture, these measures reveal a deeper

truth: energy systems underpin food and water security far more than policy frameworks typically acknowledge.

Consider irrigation. Groundwater extraction in India is not just a water issue—it is an energy-intensive process, driven by electricity and diesel. In a scenario of global oil shocks, rising diesel prices would directly increase the cost of irrigation, transportation, and food distribution. Simultaneously, power shortages—linked to fuel constraints—could disrupt agricultural operations. The IEA's emphasis on demandside management thus reinforces the World Bank's central message: resource systems cannot be managed in isolation.

India's current policy framework, however, remains fragmented. While the World Bank calls for optimising water use in agriculture, the IEA emphasises reducing energy demand in transport and industry. The intersection of these insights is where India must act. The challenge is not merely to conserve water or reduce oil dependence, but to design integrated systems that are resilient to both hydrological and energy shocks.

The fiscal dimension further complicates the picture. India spends upwards of ₹1.5 lakh crore annually on electricity subsidies for agriculture, alongside several lakh crores in broader agricultural support. Yet, a significant share of this expenditure perpetuates inefficiency. Globally, out of approximately ₹55 lakh crore spent on agriculture in 2023, only about ₹2.2 lakh crore was directed toward irrigation infrastructure. Meanwhile, rising oil prices during global shocks place additional pressure on India's import bill, fiscal deficit, and inflation. The linkage is clear: inefficient water use amplifies energy vulnerability and energy shocks exacerbate food insecurity. Climate change is intensifying these interconnected risks. Erratic monsoons, prolonged droughts, and extreme rainfall events are already disrupting agricultural cycles. In such a context, an oil shock—triggering higher fuel costs and supply disruptions—can compound existing vulnerabilities.

The IEA's recommendation to reduce nonessential transport and improve efficiency during crises may appear urbancentric, but its broader implication is systemic: demandside management is a critical tool for resilience. For India, the path forward must integrate these dual frameworks.

First, crop diversification must become central to policy. Shifting away from waterintensive crops in stressed regions is not just a water strategy—it reduces energy demand for irrigation and enhances resilience to fuel price shocks.

Second, energy–water pricing reforms are unavoidable. Moving from free electricity to targeted direct benefit transfers (DBT), combined with smart metering, can restore economic signals while protecting farmer incomes. Such reforms align with both World Bank and IEA principles: efficient resource use and reduced systemic vulnerability.

Third, India must invest aggressively in precision irrigation and solarpowered systems, such as those promoted under PMKUSUM. However, as both frameworks implicitly warn, zero marginal cost energy— whether from subsidies or solar—can lead to overuse if not governed properly. Integrating smart controls, water accounting and gridlinked sops is essential.

Fourth, urban energy demand management, as highlighted by the IEA, must be seen as part of the broader nexus. Promoting public transport, remote work, and efficient logistics reduces oil demand, stabilises energy systems, and indirectly supports agricultural resilience by lowering inflationary pressures.

Fifth, governance reforms are critical. Water, energy, and agriculture must no longer be managed in silos. A nexusbased institutional framework—integrating ministries, data systems, and planning processes—is essential for longterm sustainability.

The economic opportunities of such integration are substantial. Even a modest 10% increase in agricultural productivity can reduce poverty by up to 3%. Efficient irrigation, combined with energy resilience, can generate employment, stabilise rural incomes, and reduce exposure to climate and market shocks.

The deeper message emerging from both the World Bank and the IEA is unmistakable: the future of development lies in managing interdependencies. Food security will depend not just on water availability, but on energy stability.

Likewise, energy security will increasingly depend on how efficiently natural resources are utilised. India stands at a critical juncture. It can continue along a path of fragmented policymaking, risking compounded crises across water, energy and food systems. Or it can **embrace a systems approach—aligning incentives, leveraging technology and reforming institutions — to build a resilient and sustainable future.**